Space Weather Forecast

Issued on Tuesday, 18 January 2022 at 00:48 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Slight Chance of Minor Geomagnetic Storm G1 Thursday 20 January from re-analysed 16 January CME. Chance of isolated Moderate-class X-ray flares (R1/R2 radio blackouts) throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low through the UTC day of Monday 17 January. X-ray activity saw a double-peak common class flare from one of the most magnetically complex sunspot regions on the sun at 17/1414UTC, potentially triggering an adjacent 'filament lift off' (a possible Coronal Mass Ejection (CME)) peaking at at 17/1516UTC. The CME from this latter event was clearly visible in satellite imagery to end the UTC day, angled above and ahead of the Earth in its orbit (to no anticipated effect). This was the only CME event of note visible in the period.

There are now six sunspot regions on the sun, with a small unipolar group having faded from view near the southwestern solar horizon, while a further three active regions saw out the period as stable unipolar groups. Of the (more complex and liable to flare) bipolar regions, two showed overall decay and no significant flares. This left the northwesternmost as the most noteworthy and active spot, with some proliferation visible in its intermediate spots, although again, overall areal decay was observed.

The CME from 14 January is now considered to have passed the radius of the Earth's orbit to no effect at Earth and has been removed from the forecast. The common-class flare from one of the larger sunspots on 16 January produced a CME directed mainly to the northwest of the Earth in the plane of its orbit. This has been re-analysed and may pass Earth as a glancing blow on Thursday 20 January.

Solar Wind / Geomagnetic Activity: The solar wind was symptomatic of connection to a high speed stream, thought to be that emanating from a large southern solar hemisphere 'coronal hole'. The solar wind speed was elevated but near-level, with a brief lull seen during the early UTC evening. The number of particles comprising the solar wind and their associated magnetic field were both slightly elevated but otherwise unremarkable.

The net result of the above solar wind measures was mainly quiet geomagnetic activity, peaking early and late, but well below Minor Storm G1.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be low, with the daily risk of significant flares revised slightly downwards relative to recent guidance given the observed lack of activity and simplifying front-sided sunspot groups. Having said this, the slightly rising trend remains in the four days,

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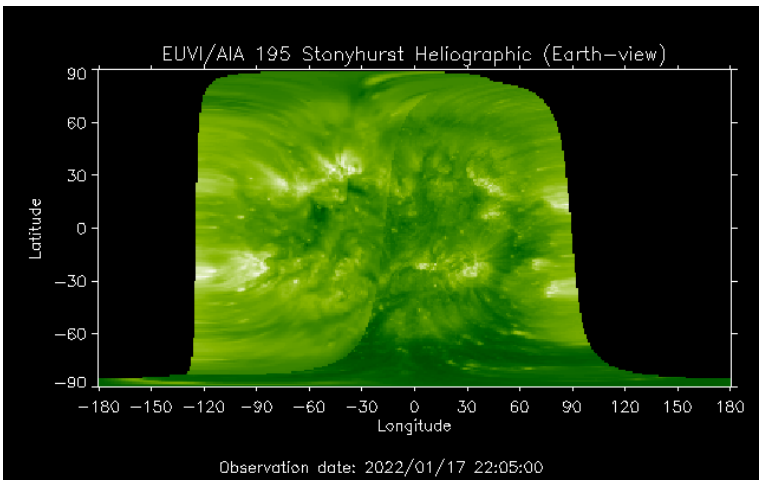
with a daily chance of moderate-class flares - the result of the potential arrival of further active regions over the southeastern solar horizon in the period.

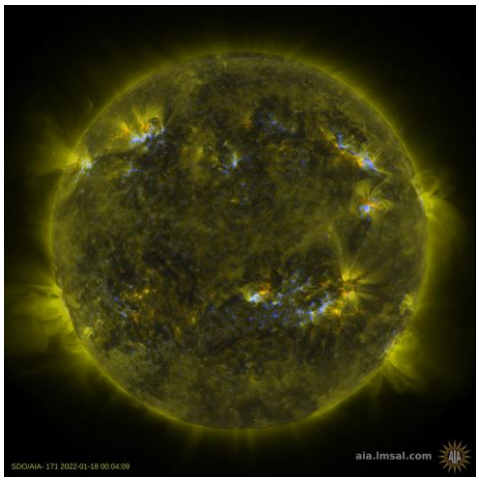
Solar Wind / Geomagnetic Activity: A CME associated with a filament lift-off on the afternoon UTC of 14 January is now considered most likely to have passed to no effect at Earth and is removed from the forecast. The CME from the common class flare from 16 January may carry an Earth-directed component, with a possible glancing blow arriving in the UTC day of Thursday 20 January. This gives perhaps a slight chance of G1 within this UTC day.

The only 'coronal hole' fast wind feature due in the four days is expected to be the current one. A gradual decline toward a slow regime is therefore expected from midweek (independent of the potential CME mentioned above), with increasingly quiet geomagnetic activity expected.

Energetic Particles / Solar Radiation: The weight of sunspot groups and activity in the western solar hemisphere is leading to a raised risk of S1 in the coming four-day period, although the effect is very slight.

Figure 1: Left: False colour cylindrical projection of the sun in extreme UV light, showing potential large arriving sunspot(s) in the southern solar hemisphere (near -90 degrees). Right: Composite image of extreme UV light and magnetic imagery, showing possible correlating magnetic loops to the newly arriving regions in the lower left of the image (at 90 degrees East). The X-ray flux recorded near Earth is as yet unmoved.





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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	20	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	20	25	25	25
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	2	2	2	2
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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